Science talks on EDCs and smoking update Council

By Ernie Hood

Science marches on, and one way for members of the National Advisory Environmental Health Sciences Council to keep up with new developments in NIEHS research is hearing the two scientific talks typically scheduled into their meetings. At the May 14-15 session, members heard presentations on a new international report on the state of the science for endocrine disrupting chemicals (EDCs), and new intramural findings on genome-wide interactions with smoking.

During his summary of the UNEP-WHO report on EDCs, Zoeller noted that NIEHS has been a major contributor to substantial research progress in the field over the past decade. (Photo courtesy of Steve McCaw)

SOS on EDCs

Thomas Zoeller, Ph.D., *(http://www.bio.umass.edu/biology/about/directories/faculty/r-thomas-zoeller)* professor of biology at the University of Massachusetts Amherst, briefed Council on the report "State of the Science of Endocrine Disrupting Chemicals – 2012," *(http://www.who.int/ceh/publications/endocrine/en/index.html)* issued in February by the United Nations Environment Programme (UNEP) and the World Health Organization (WHO). Zoeller was a co-author and co-editor of the landmark publication, which updated the 2002 UNEP-WHO "Global Assessment of the State of the Science of Endocrine Disruptors" report, incorporating the considerable progress in the field over the last decade. NIEHS Program Administrator Jerry Heindel was also a co-author and co-editor.

Zoeller said the time was ripe to consolidate recent developments in the field. "There have been major initiatives, both in the U.S. and in Europe and Japan, focused on endocrine disruption, and it was a good time to take stock in where we were, to characterize the information, and think about where it should go and what we've learned, to identify key concerns and future needs, and to recognize that chronic, noncommunicable disease is at the highest level in history," he noted.

London told Council members that in utero exposure to maternal smoking has a dose-response effect on DNA methylation patterns in newborn offspring. (Photo courtesy of Steve McCaw)

The report is comprised of sections focusing on the definition of endocrine disruption, establishing the evidence for endocrine disruption in humans and wildlife, human and wildlife exposures to EDCs, and future needs and emerging issues of concern. "The document represents a single place that has captured a very large amount of information in a way that allows you to see the big picture," said Zoeller. "When you see, in a single place, the trends that are occurring in reproduction, neurodevelopment, and immunology, etc., I think it makes a much stronger statement."

Among the significant conclusions included in the report was the concept that experimental studies are demonstrating very clearly the complexity of EDC actions on development and adult physiology, as new science emerges on delayed and epigenetic effects of EDC exposures.

In an April 2013 EHP editorial, *(http://ehp.niehs.nih.gov/1306695/)* NIEHS and NTP Director Linda Birnbaum, Ph.D., described the report as "mandatory reading for everyone who is interested in protecting and improving human health."

London acknowledged the support of her research group as she concluded her presentation. (Photo courtesy of Steve McCaw)

Smoking guns in the genome

In the second Council science talk, "Genome-Wide Interactions With Smoking – Served Two Ways," intramural researcher Stephanie London, M.D., Dr.P.H., described two recent research initiatives emerging from her laboratory, using genome-wide analysis techniques to assess the impact of smoking.

The first project incorporated smoking into genome-wide interaction studies of pulmonary function in adults. London's group, along with collaborators, identified 16 novel loci (specific locations on genes) that are responsible for determining proper lung function. It was a unique approach to genome-wide association studies (GWAS), expanding the method to yield previously unattainable results. "This work showed that including environmental factors in GWAS, using joint tests of main effects and interactions, can discover novel loci that you would miss if you analyzed just the genetic main effects alone, and this is true even when the interactions are not strong," said London.

The second project related findings from studies of epigenetic interactions with smoking, involving maternal smoking during pregnancy and genome-wide DNA methylation in newborns. London's group, and collaborators from Duke University, the University of North Carolina at Chapel Hill, and Norway, found epigenetic effects suggesting that differing DNA methylation patterns in newborn children of smokers versus non-smokers may play a mechanistic role in adverse health outcomes later in the children's development.

The work pointed toward two genes known to be associated with response to exposure to polyaromatic hydrocarbons contained in cigarette smoke, and to several other novel genes for smoking effects. "These results support the hypothesis that epigenetic mechanisms may contribute to offspring health effects from maternal smoking in pregnancy, and we also note that the methylation differences seen for adult smoking in other studies are already present at birth in relation to *in utero* exposure," London explained.

(Ernie Hood is a contract writer with the NIEHS Office of Communications and Public Liaison.)

Council member Vivian Cheung, M.D., of the University of Pennsylvania asked London whether paternal smoking may contribute to the DNA methylation mechanism in newborns. London replied that the researchers had not found an effect for passive smoking exposure in this case. (Photo courtesy of Steve McCaw)

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Email the Web Manager at webmanager@niehs.nih.gov